

## **4.0 OUT-OF-STREAM WATER USE**

Water use estimates for current and future conditions are a required element of watershed planning under RCW 90.82.070 (1d) (1e), and provide baseline information for development of management strategies in a watershed plan. This chapter addresses out of stream, human-related water use. Naturally occurring water use, such as forest-related consumptive use and evapotranspiration losses are described in the context of the overall water balance in Section 5. Non-consumptive uses, including fish, wildlife, and recreation, are not discussed in this document. However, it is important to recognize that these in-stream uses are critical to the watershed system as a whole. A discussion on fisheries habitat in the WRIA is included in Section 7.

Types of human-related water use in the WRIA 20 watershed are characterized in this section according to the following categories:

- Municipal Purveyor withdrawals (residential and commercial uses);
- Exempt well withdrawals (rural residential uses);
- Agriculture/Irrigation;
- Forestry;
- Tribal
- Other combined uses.

Current and future water use in WRIA 20 is aggregated according to the seven sub-basins. Water use in WRIA 20 is relatively small compared with many other WRIs. This is due to factors such as the small population and the lack of significant irrigation in the WRIA. The five Pacific sub-basins (Pacific 1-5) were excluded from this analysis. The majority of primary water uses in the watershed were quantified using existing data.

Watershed planning typically focuses on the water balance and the way that humans affect it through the water use component of the water balance. Water use can be broken into two components, consumptive use and non-consumptive use. The non-consumptive use component is characterized by water that, after being put to beneficial use, is returned to the hydrologic system via mechanisms such as wastewater treatment plants, septic systems, and infiltration of excess domestic and agricultural irrigation water. Consumptive use is water that is not returned to the WRIA 20 basin hydrologic system after use. Examples of consumptive water use include evapotranspiration from forestland and agricultural crops, evaporation of open water, and evapotranspiration of water used for landscaping and home gardening. Most of the data available for this water use analysis do not break total use into consumptive and non-consumptive components.

### **4.1 General Water Use Assumptions**

The general approach to determining total current and future residential water use in WRIA 20 in this assessment uses a per capita water use based on Forks Water System data, which is applied to population data from the U.S. Census (to estimate exempt well use) and to Washington Department of Health (WDOH) service connection data (to estimate Group A and B water system use). This method is applied at both the watershed and individual sub-watershed level. Several key assumptions are necessary to calculate overall water use in the WRIA. These include the following:

### Per Capita Water Use

An average daily per capita water use factor of 121 gallons per day per capita (gpdpc) is used for the following analysis. This factor is derived from City of Forks pumping data (May 2002 through June 2004), and a population served by the Forks water system of 5000 people (reported in the WDOH Compliance Monitoring Database [2002]). This per capita water use factor is assumed to apply over the entire watershed and to both residential use from municipal systems and exempt well use. This per capita water use factor is used in this assessment to obtain current and future population-based exempt well annual water use quantities. Forks municipal water use was divided by the population serviced by the Forks Water System to determine an average daily per capita water use for each month, which were then averaged to obtain a per capita use of 121 gpdpc. R.C. Lane reports a per capita use factor of 100 gpdpc for Clallam County (Lane, 2004). This estimate appears quite low when compared to the calculated value for the City of Forks.

### Average Number of Persons Per Household

Estimates of total population utilizing purveyor water were made assuming an average of 2.75 people per connection served by a public water system (PWS) (Clallam County Western Regional Comprehensive Plan, 2002). Estimates of the number of residences served by exempt wells were also made assuming 2.75 persons per residence.

### Washington Department of Health Compliance Monitoring Database

The WDOH compliance monitoring database contains the water quality information and well data for public drinking water systems throughout the state. This database was queried to obtain information on public water system wells located within WRIA 20.

The WDOH database is comprised of several information management systems, including SADIE, DWAIN, and SENTRY systems. The WDOH Drinking Water Division Information Technology Project Section is responsible for analysis, design, development and deployment of two information management systems for public water systems, including water system operators and water sample results. The two systems are the Drinking Water Automated Information Network (DWAIN) and the System for Automated DWAIN Information Extraction (SADIE).

## **4.2 Current Water Use**

This section summarizes current water use and the data used to summarize each type of use in WRIA 20. This summary is limited to readily available, existing information. Tables 4-1 through 4-7 provide detailed breakdowns on water use. A summary of annual water use by category and sub-basin is presented in Table 4-6. Data presented in this section are used in the annual and monthly water balance presented in Section 5.

### **4.2.1 Municipal Purveyor Water Use**

Purveyors are entities that provide water to the public and private sector. For the purposes of this analysis, the term purveyor is defined as all public water systems (PWS), including municipalities, water districts and privately owned public water systems that provide water to two or more service connections. A PWS is defined by the WDOH as any domestic water supply serving more than a single-family residence. The WDOH regulates public water systems under two main categories. Group A systems are those systems regulated under the Federal Safe Drinking Water Act (SDWA). Group B systems are regulated under state law, but not under the SDWA.

The PWS identified in the WDOH database are listed in Table 4-1, and are defined as follows:

- Group A, Community Water Systems, provide water to 15 or more service connections used by residents for 180 days or more per year, or provide water to less than 15 connections that serve at least 25 year-round residents. There are 9 active Group A Community Water Systems located within the 7 primary sub-basins of WRIA 20 (Table 4-1).
- Group A, Non-Community Water Systems provide water to the public, but not to residential communities. There are two categories: transient and non-transient. Examples of WRIA 20 non-community uses include campgrounds, motels, restaurants and those relating to commercial forestry. There are 13 active Group A Non-Community Water located within the 7 primary sub-basins in WRIA 20 (Table 4-1).
- Group B systems include systems that serve smaller communities and subdivisions ranging from two to 14 residential service connections. There are 27 Group B systems located within the 7 primary sub-basins in WRIA 20 (Table 4-1).

Figure 2-6 shows the location of Group A and B systems in the watershed.

Table 4-2a summarizes total current domestic water use in the WRIA. This domestic use is comprised of both municipal purveyor use and exempt well use (exempt well use is discussed in the following section). Municipal purveyor water use estimates were developed using service connection information provided in the WDOH database.

The WDOH database indicates that 1,450 connections and 5,000 people are currently served by the City of Forks PWS. These figures were applied to water use data for the City of Forks. It should be noted that the U.S. Census reports a total Forks population of 3,120 for the year 2000. The City of Forks public water system service area extends outside of the City of Forks incorporated area.

The footprint for the City of Forks is distributed between three sub-basins, with approximately 26% of the Forks' land area within the Bogachiel sub-basin, 70% within the Calawah sub-basin and 4% within the Sol Duc sub-basin. These percentages were applied to the WDOH reported number of connections for the Forks PWS (along with other connections in those sub-basins) to calculate the number of connections within each of the three sub-basins. It should be noted that even though Forks Public Water System services connections outside of the city's footprint, using the land area within the city's boundary was the best method available with the existing data for determining the connection and population distribution amongst the three sub-basins.

The connection use factor of 2.75 people per connection was obtained from the Clallam County Western Regional Comprehensive Plan, but was originally reported in the 1989 City of Forks Comprehensive Water System Plan. The Forks Plan is outdated and the City of Forks has plans to make updates in the near future. For the purposes of this assessment and until further data are made available, it is assumed that the per connection use factor is relatively accurate and applicable to WRIA 20.

Table 4-2b summarizes water use by non-community public water systems. Non-community water use is assumed to occur for approximately half the year and at half the rate of domestic use.

### Base and Peak Use

In general, purveyor water use is comprised of two components: a low base use component characterized by water that is used consistently over an annual cycle, a significant portion of which is returned to the hydrologic system through wastewater treatment plants and septic systems; and a high peak (consumptive) use component usually occurring during drier warmer months, in the form of landscaping and home garden irrigation. Purveyor water use is typically expressed on a per capita basis and a peaking factor is commonly used to represent the increase in outdoor watering during the summer. Table 4-3 presents the City of Forks monthly withdrawal records. These records indicate that there does not appear to be a large difference in water use during winter and summer months. This is likely due to high rainfall and the lack of a need for significant lawn irrigation during the summer months in WRIA 20.

Table 4-3 indicates that base water use ranges between 108 and 123 gallons per day per capita (gpdpc). Maximum summer water use is on the order of 158 gpdpc, which is equivalent to a peaking factor of approximately 1.4, a factor that is significantly less than typical peaking factors found elsewhere in the state.

Discharges from the City of Forks wastewater treatment plant in 2004 are presented in Table 4-3. These data are compared to 2003 water use data for the City of Forks to evaluate consumptive water use. Discharge volumes have relatively low variability throughout the year, with per capita discharge rates ranging between 91 and 117 gpdpc for an annual average discharge of 101 gpdpc.

### Consumptive and Non-Consumptive use

The consumptive and non-consumptive components of residential water use in WRIA 20 can be estimated by comparing the City of Forks per capita water withdrawals and wastewater discharges over a specified time period. Although the water system and the sewer system service areas are different, comparison of per capita water use to per capita wastewater discharge can be used to approximate consumptive water use. The difference between wastewater discharge and water supply withdrawal is equivalent to municipal consumptive use. Table 4-3 presents the total water use and the amount of that water returned to the hydrologic system from City of Forks pumping and discharge data, respectively. Comparison of these data show that approximately 85% of the water withdrawn by the City of Forks is returned to the natural system via wastewater discharge or septic system infiltration on an annual basis. Consumptive use estimates can be used for purposes of the overall water balance.

An annual estimate of 85% consumptive use is relatively high. Because the sewer and water service areas for the City of Forks are different, a direct comparison of water use and wastewater discharge is difficult. It should be noted that a larger proportion of Fork's water service area serves single family residences, and that the per capita wastewater estimates may be skewed by the larger portion of commercial hookups in the sewer service area than the water service area. We were unable to obtain a breakdown of residential versus commercial waste water hookups from the City for purposes of this analysis.

#### 4.2.2 Exempt Well Use

Single domestic water supplies in WRIA 20, if not provided by a municipal or purveyor system, are typically drawn from either exempt wells or permitted surface water sources. Domestic exempt well withdrawals are defined as "any withdrawal of public ground waters for stock-watering purposes, or for the watering of a lawn or of a noncommercial garden not exceeding one-half acre in area, or for

single or group domestic uses in an amount not exceeding five thousand gallons a day, or for an industrial purpose in an amount not exceeding five thousand gallons a day” (RCW 90.40.50).

Exempt wells are an important factor in watershed planning and they can comprise a significant portion of water use within a WRIA. However, the total number of wells and quantity of water withdrawn by exempt wells is not well known. Wells described as exempt wells are exempt from the requirement to obtain a water right from Ecology under RCW 90.44. RCW 90.44.050.

Individual household water supplies from surface water sources are not exempt from the requirement to obtain a water right, and as such individual household surface water uses should be included in Department of Ecology water right/claims records, as described in Section 2.

Although exempt wells are allowed to use up to 5,000 gallons per day, which is equivalent to a maximum annual use of 5.6 acre-feet per year (0.0077 cfs), individual household use is usually a much smaller annual amount. Exempt well water use patterns typically mirror that of the municipal system, but may be higher or lower, depending on a number of factors.

Variables contributing to higher water use from exempt wells include:

- There is no meter charge for exempt wells as there is for water supplied by municipal purveyors, therefore there is less incentive to conserve water (aside from the electrical bill associated with pump operation);
- Exempt wells occur in rural areas with larger lot sizes. Therefore landscaping and garden use can be higher than in more developed areas; and
- Exempt wells occur in rural areas that commonly support livestock with wells.

Variables contributing to lower water use from exempt wells include:

- Exempt wells may be installed in less productive aquifers which limit the volumes of water that can be withdrawn.
- Exempt wells may support homes in rural areas that do not have any landscape water needs.
- Some exempt wells support seasonal vacation homes that are not regularly occupied.
- Exempt wells are sometimes located on vacant lots with no actual water use.
- Properties with irrigation rights would only use their exempt wells for indoor use, resulting in lower consumptive use of the exempt well.

#### Number of Exempt Wells

A detailed study to identify, locate and map exempt wells in WRIA 20 has not been conducted. The residential population served by exempt wells in each sub-basin was calculated using 2000 U.S. Census (2000) data and subtracting the number of residents served by PWS. The total 2000 population of full time residents in the 7 major WRIA 20 sub-basins is 7,181. The total population served by PWS is 4,334. The remaining resident population of 2,847 is serviced by exempt wells. This assumes that the number of single households being served by permitted surface water withdrawals is negligible.

Table 4-2a summarizes the estimated number of permanent resident exempt well users and exempt well water use in each sub-basin. The Clallam County Western Regional Comprehensive Plan reports an average household size of 2.75 people per residence. Using this factor, we estimate that 1,035 permanent residences are serviced by exempt wells in WRIA 20. Total water use by persons on exempt wells in WRIA 20 is 386 AF/yr or 0.53 cfs averaged over the year.

Actual exempt well water use may vary depending on whether a secondary irrigation source is available to a household with an exempt well. Existing data estimating per capita exempt well water use for homes with a secondary irrigation supply are not currently available.

#### 4.2.3 Agricultural Water Use

Based on National Land Cover Database (NLCD) land coverage data, agricultural lands comprise approximately 2355 acres within WRIA 20, accounting for 0.3% of the total land cover. This small percentage of agricultural land in WRIA 20 was confirmed through conversations with representatives from both the Clallam and Jefferson County Conservation Districts, who agreed that agricultural consumptive uses are probably negligible in WRIA 20.

The land cover data set used to calculate agricultural water use was obtained from the NLCD and is interpreted from 1992 LANDSAT Thematic Mapper satellite images with 30 meter resolution. Because of the scale of these satellite images, the land cover information presented here is effectively the average of the land cover per 30 square meter pixels across the watershed. Users accuracy for the data set is estimated to be between 57% and 93% for aggregated land use classes with overall average accuracy of 83%. This land cover information can be used to provide an understanding of overall land cover distribution in the watershed in 1992, but is not expected to be accurate at a small scale (i.e., land cover distribution within one mile of Forks).

Agricultural consumptive use can be divided into two general categories, irrigation and stock watering. Irrigation water constitutes water applied to crops, which includes conveyance losses, application losses and evapotranspiration by the crop. In order to estimate water use for agricultural irrigation, the amount and location of irrigated acreage must be identified. There is little irrigable acreage in WRIA 20. Stock water use refers to the amount of water used by farmers to maintain stock. Much of the agricultural land in the watershed is used as pasture for livestock, and there may be some livestock-related water consumption (Personal Communication, Al Latham, Jefferson County Conservation District, 6/1/2004). However, total stock water use is not precisely known and in comparison to other water uses in the watershed, is not considered significant and has therefore been excluded from further analysis.

USDA 2002 Agricultural Census data for Clallam and Jefferson Counties confirm that there is very little irrigated agriculture in either of these counties, comprising approximately 0.4% of all lands within Clallam County and 0.06% of all lands in Jefferson County. This data source reports total cropland, (including harvested, failed, fallow and idle croplands as well as lands used for pasture, grazing and cover crops) and the total number of irrigated acres by county. Clallam County is shown to have a total of 13,469 acres of cropland and of this, 4,691 acres are reported as irrigated acres. Jefferson County is reported as having 5,640 acres of agricultural land, of which 754 acres are reported as irrigated. Using these data, irrigated agriculture comprises approximately 34.8% of the total agricultural lands in Clallam County and approximately 13.4% of the total in Jefferson County. The majority of agricultural irrigation in Clallam County occurs in the Dungeness Valley, which is not a part of WRIA 20 (personal communication, Joe Holtrop, Clallam County Conservation District 6/1/2004), therefore 34.8% is likely an overestimate of irrigated acreage in WRIA 20. Based on conversations with representatives from the local conservation districts and the high rate of

precipitation known to occur in WRIA 20, the irrigation estimate of 13.4% for Jefferson County more likely reflects conditions within WRIA 20 and will therefore be applied to the NLCD total agricultural lands data to obtain the number of irrigated acres in WRIA 20.

To estimate irrigation water use in each WRIA 20 sub-basin, an irrigation duty of 1.5 feet per year, reported for Jefferson County (Lane, 2004), was applied to the irrigated acreage within each sub-basin. As described above, irrigated acreage for each sub-basin was calculated by assuming that 13.4% of the total agricultural lands reported by NLCD are irrigated (Table 4-4). This estimate indicates that approximately 473 acre-feet per year (or 0.65 cfs) of water is used for irrigation in WRIA 20. In light of the high precipitation rates and the likelihood that pastures are only watered during summer months, this is likely an overestimate of water use related to agricultural activities. However, no data are available, specific to WRIA 20 (and western Clallam County) that can provide more accurate estimates of irrigation water use in the WRIA at this time. Based on the reported overall accuracy of the NLCD data (83%) used to calculate agricultural water use, we can assume that at a minimum, this level of error is also present in the agricultural water use calculations. Using the accuracy estimate provided by NLCD, actual agricultural water use can be assumed to range between 393 acre-feet per year (0.54 cfs) and 554 acre-feet per year (0.77 cfs) in WRIA 20.

As described in Section 3, water rights and claims specified to have an “irrigation” purpose of use account for about 580 acre-feet of water per year from groundwater, and 847 acre-feet per year from surface water. The water rights for irrigation purposes are well above the estimated water use for irrigation (473 acre-feet per year), and may be used to represent an upper bound of potential irrigation water use. It should be noted, however, that the assignment of an “irrigation” purpose to a water right may also include other purposes such as domestic supply, and therefore the estimate of water allocated for irrigation is also likely overestimated.

#### 4.2.4 Forestry-Related Use

Based on conversations with forestry representatives from the U.S. Forest Service (USFS), the Washington Department of Natural Resources (WDNR) and private timber industry, there is no significant water use associated with the forest industry in WRIA 20 (personal communication, Sue Trettevik, June 18, 2004; Vern Ferrell, June 18, 2004; and Bill Peach, July 8, 2004). There may be forest fire-related water use during the summer months, but these uses are also believed to be insignificant (personal communication, Bill Peach, July 8, 2004).

#### 4.2.5 Tribal Water Use

There are three tribes within WRIA 20; the Hoh, Makah, and Quileute Tribes. There are four Tribal reservations, however the Ozette Reservation is under treaty jurisdiction of the Makah Tribe and is currently managed as wilderness. Water use data for the Hoh and Makah Tribes are not included in this water use assessment by request (personal communication, Jim Jorgensen, July 12, 2004; and Jeff Shellberg, June 9, 2004, respectively). The Quileute Tribe draws its water from two wells located in the Three Rivers area (the confluence of the Bogachiel and Sol Duc Rivers, which form the Quillayute River). The wells are approximately 60 feet apart and pump in an alternating manner (Schuch, 2003). Water use data for the Quileute Tribe are summarized in Table 4-5 and were calculated using monthly production data for 1995, 1997, 2000 and 2002, provided by the Three Rivers Water Plant. Based on these data, total annual water use for the Quileute Tribe is approximately 148 acre-feet per year, or 0.20 cfs. The Quileute Reservation is located in Sol Duc sub-basin and this water use is therefore applied to the total water use estimate for this sub-basin.

#### 4.2.6 Total Annual Water Use

Table 4-6 presents a summary of the total annual water use for each of the categories discussed above. The water usage estimated for each category is totaled by sub-basin. Total water use for all categories in WRIA 20 equals 1,594 AF/yr, or 2.2 cfs. Residential water use, including both municipal use and use of exempt wells, comprises the largest overall water use in the watershed. Agricultural water use (irrigation) also comprises a significant portion of the total annual water use. However, the lack of data regarding irrigable acreage leads to an overly conservative estimate of irrigation.

### 4.3 **Future Water Use**

Estimates of future water use are a required component for Phase II Watershed Planning under HB2514. Agricultural water use appears to be a significant water use, however this use is likely over-estimated, as discussed in Section 4.2.3. The primary water use in WRIA 20 is for domestic purposes. Therefore, domestic water use is the only projected future water use that will be determined for this assessment.

#### 4.3.1 Future Municipal (Purveyor) and Domestic Exempt Well Use

Projected water use for municipal and domestic purposes was calculated by determining the projected 2025 population in each sub-basin based on observation of the population trend from 1990 to 2000. The projected future water use was calculated assuming that projected water use rates are equivalent to the current water use rates, and that the population trend observed from 1990 to 2000 is linear through 2025. The exceptions are the Bogachiel, Dickey, and Sol Duc sub-basins, where populations have decreased by 34%, 51%, and 4% respectively between 1990 and 2000. In the cases of decreasing populations, it was conservatively assumed that populations (and thus water use) will remain the same through 2025.

Population data were obtained from the U.S. Census Bureau for the 1990 and 2000 U.S. Census and were distributed by census block for each sub-basin. Where census blocks straddle sub-basin boundaries, the population of the census block was distributed between the sub-basins proportional to the area of the census block in each sub-basin. This assumes the population to be evenly distributed within the block. In actuality, this may not be the case. However, the error is considered acceptable for the purposes of this study given the size of the population being examined.

The projected water use estimate is based only on population estimates. Growth or declines in water use is not broken out between municipal and exempt wells because it is difficult to determine where growth will occur within a sub-basin, if the growth will occur on purveyor systems or exempt wells and how the water supply system would choose to accommodate growth demands. It is anticipated that any significant future growth would likely be served by public water systems instead of exempt wells. In addition, water use savings as the result of conservation was not investigated or incorporated into the projected water use estimate.

Residential water use in the year 2025 was estimated using the projected 2025 watershed population of approximately 9,093 people, as shown in Table 4-7. Total residential water use (PWS and exempt wells) in 2025 is estimated at 1,232 AF/yr, or 1.7 cfs, slightly more than the estimated current water use of 973 AF/year or 1.34 cfs (for PWS and exempt wells).

The OFM (Office of Financial Management) provides high, medium and low growth estimates for Clallam County. The high estimate is 35%, the medium is 21% and the low estimate is 5%. This



approach, utilizing Census data, assumes that growth will be even less than the low estimate by OFM. Growth in Clallam County is primarily occurring in the northwestern portion of the County which does not encompass WRIA 20. Population trends within the actual sub-basins are likely more representative of future growth.

#### **4.4 Summary**

The generally low population density and lack of commercial and industrial facilities that characterize WRIA 20 result in relatively small quantities of out-of-stream beneficial water use in the watershed as compared to other WRIs. The following is a summary of primary findings regarding water use in WRIA 20:

- The primary consumptive water use in the watershed is from individual households on public water supply systems or individual households on self-supplied systems;
- Future (2025) household water use is not expected to increase significantly in WRIA 20 due to low projected population growth.
- Water use demands outside of WRIA 20 are expected to increase, and may result in an increase in the use of WRIA 20 water for outside entities. There is concern that these projected demands may outweigh the low population growth projections within WRIA 20 and result in net increase in water use. For example, increasing population and water use demands from outside areas (such as Port Angeles) may result in increased development of water supplies in areas such as WRIA 20. Therefore, relying on population estimates within the WRIA 20 boundaries may not reflect actual or potential water supply demands.
- Many individual households are not serviced by public water supply systems and use exempt wells as a water source. There is no single database that summarizes the location and extent of exempt wells in the watershed. To better understand the effects of exempt wells on both the groundwater resource and instream flows, an estimation of their number, their spatial distribution and depth, and the actual amount of water consumptively used needs to be made.
- Some individual households may use surface water or groundwater for which they hold a certificate or permit. Single residential water use by water right holders is not addressed as it is assumed to be quite small. Further discussion about surface water rights for domestic use are included in Section 3.
- Forested lands (as compared to residential and agricultural land) encompass the greatest percentage of land cover in the basin. It has been indicated that human water use resulting from forest practice activities is negligible (personal communication, WDNR, USFS, Bill Peach, July 8, 2004). However, evapotranspiration losses through forest vegetation comprise a large and significant component of the overall consumptive water use in the basin. This consumptive water use associated with forested lands is addressed in the water balance in Section 5.
- There are other types of water use including self supplied use for commercial or industrial purposes (i.e., not supplied by a water purveyor), however since there are no existing data available to estimate actual water use for these purposes, this category of water use has not been evaluated.
- There are substantial volumes of surface water rights allocated throughout WRIA 20, particularly in the Sol Duc sub-basin. The majority of the surface water rights are

designated for commercial/industrial purposes, such as shingle operations and timber companies. A large water allocation is also noted for the National Forest for domestic purposes. These rights represent the volume of surface water that may be withdrawn, but do not reflect the actual water use, as a significant portion of the allocated water may not be put to use. Personal Communication with forestry representatives from the USFS, WDNR and private timber industry have stated that there is no significant water use associated with the forest industry in WRIA 20 (June 18 and July 8, 2004).